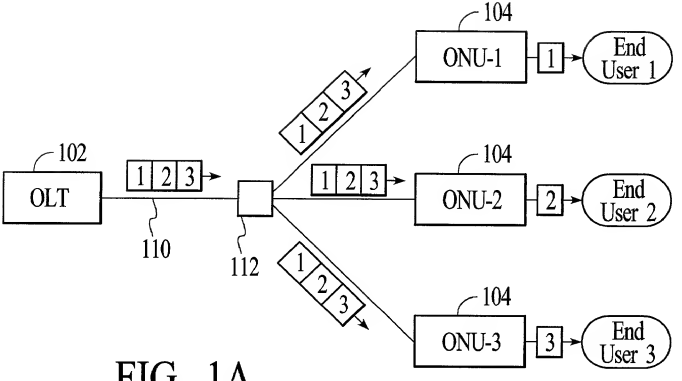
104
ONU-1
1
End User 1
1 2 3
102
OLT
1 2 3
110
112
1 2 3
104
ONU-2
2
End User 2
1 2 3
104
ONU-3
3
End User 3

FIG. 1A

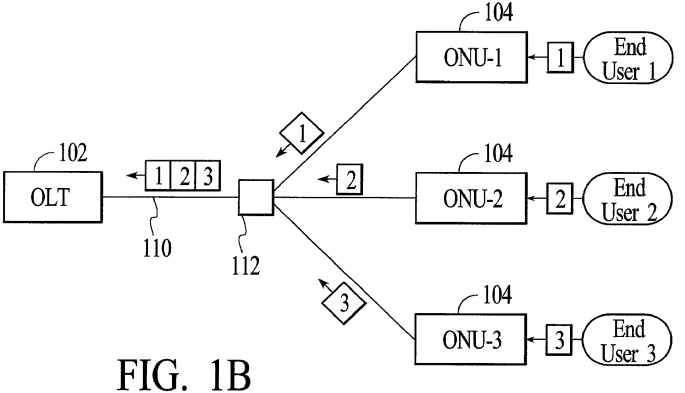
104
ONU-1
1
End User 1
1
102
OLT
1 2 3
2
104
ONU-2
2
End User 2
110
112
3
104
ONU-3
3
End User 3

FIG. 1B

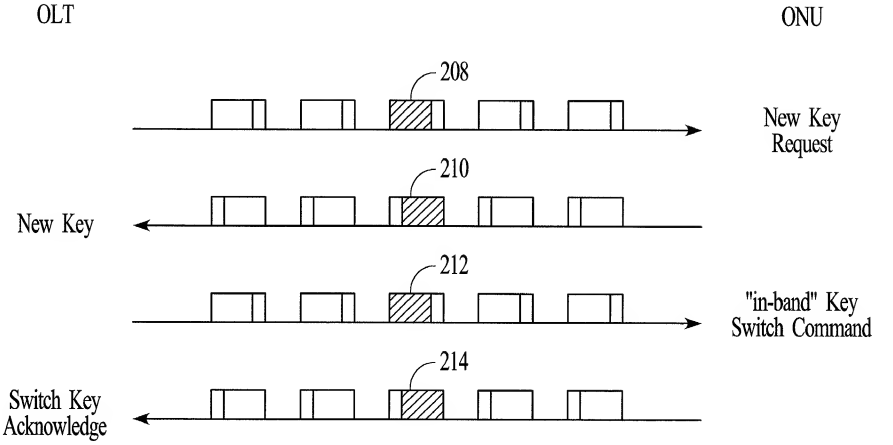
OLT
ONU
208
New Key Request
210
New Key
212
"in-band" Key Switch Command
214
Switch Key Acknowledge

FIG. 2

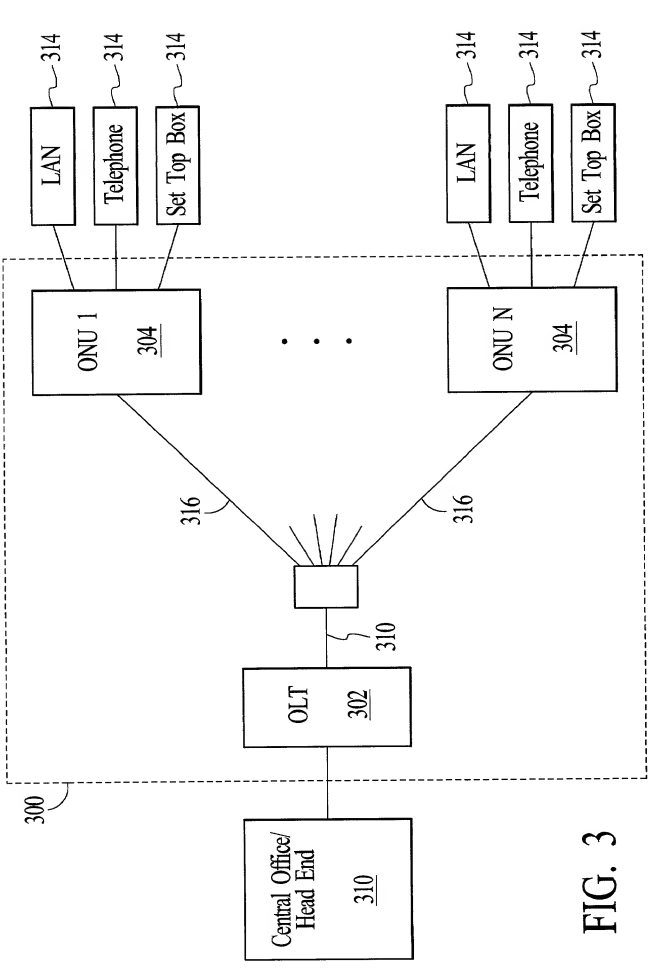
300
Central Office/
Head End
310
OLT
302
310
316
316
ONU 1
304
ONU N
304
LAN
Telephone
Set Top Box
LAN
Telephone
Set Top Box
314
314
314
314
314
314

FIG. 3

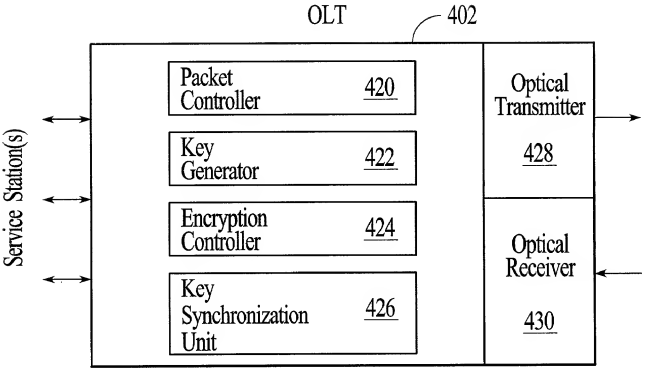
OLT
402
Packet Controller
420
Key Generator
422
Encryption Controller
424
Key Synchronization Unit
426
Optical Transmitter
428
Optical Receiver
430
Service Station(s)

FIG. 4

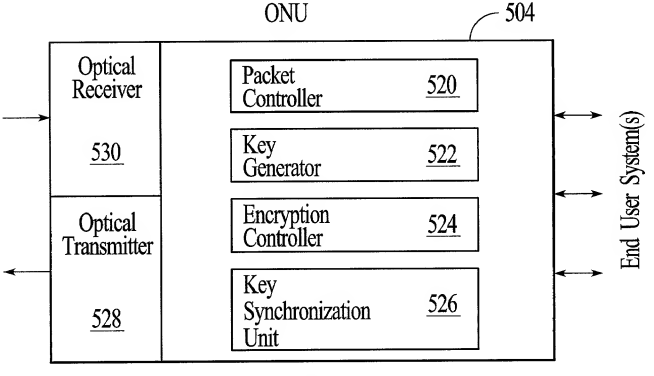
ONU
504
Optical Receiver
530
Optical Transmitter
528
Packet Controller
520
Key Generator
522
Encryption Controller
524
Key Synchronization Unit
526
End User System(s)

FIG. 5

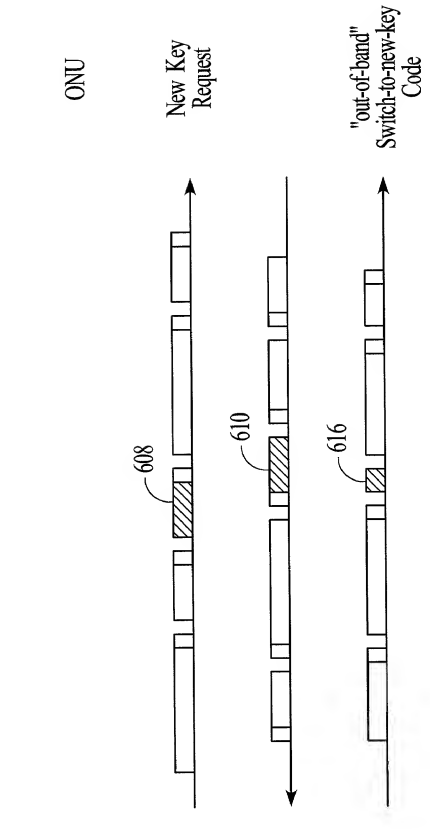
OLT
ONU
New Key Request
608
610
New Key
616
"out-of-band" Switch-to-new-key Code

FIG. 6

PUBLISHED SEARCHED

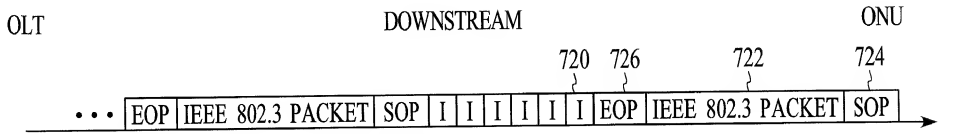

FIG. 7 (PRIOR ART)

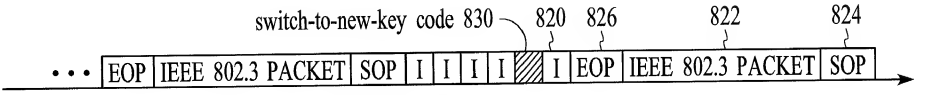

FIG. 8

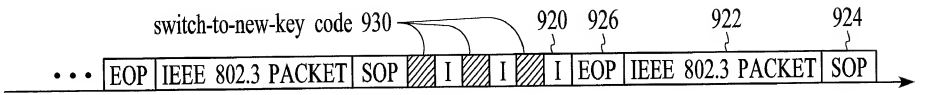

FIG. 9

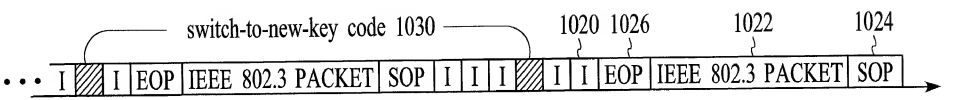

FIG. 10

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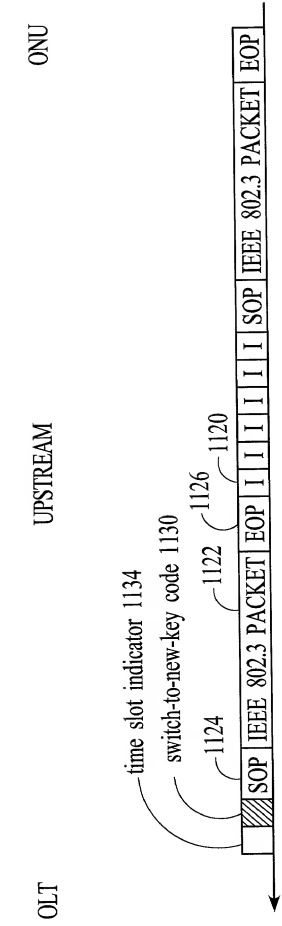
OLT
UPSTREAM
ONU
time slot indicator 1134
switch-to-new-key code 1130
1124
1122
1126
1120
SOP
IEEE 802.3 PACKET
EOP
I
I
I
I
I
I
I
I
SOP
IEEE 802.3 PACKET
EOP

FIG. 11

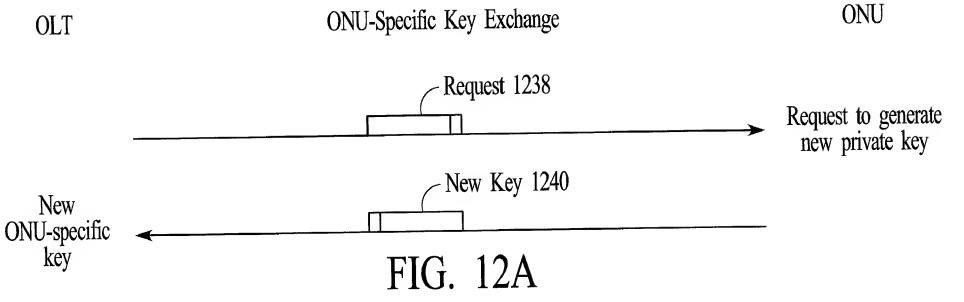

FIG. 12A

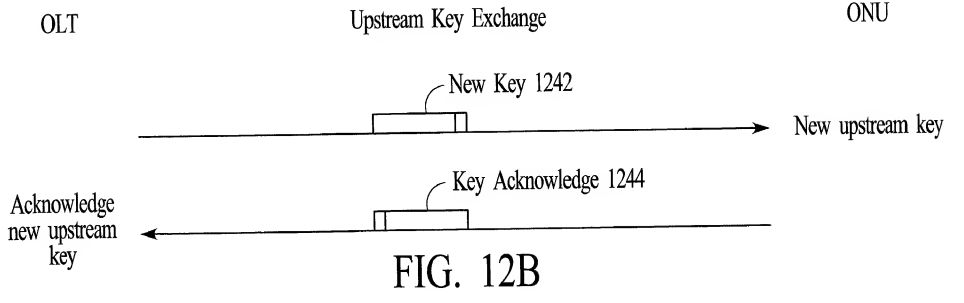

FIG. 12B

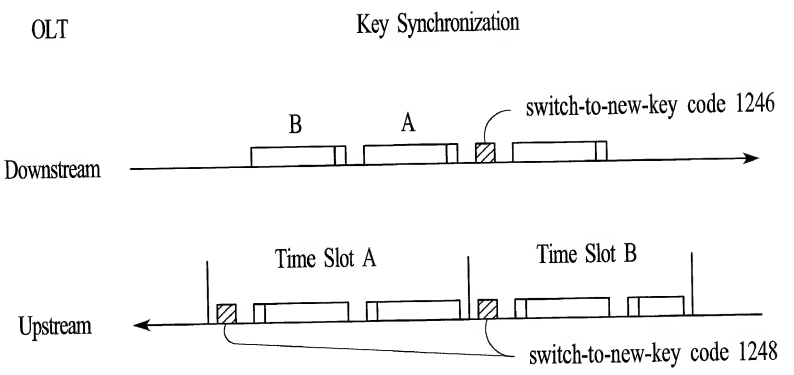
OLT
Key Synchronization
ONU
B
A
switch-to-new-key code 1246
Downstream
Time Slot A
Time Slot B
Upstream
switch-to-new-key code 1248

FIG. 12C

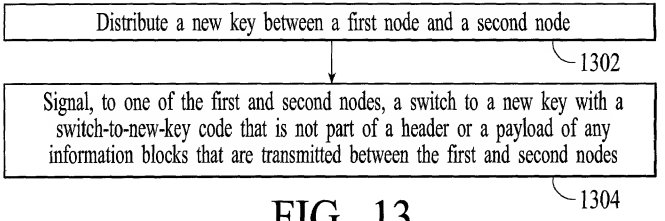
Distribute a new key between a first node and a second node
1302
Signal, to one of the first and second nodes, a switch to a new key with a switch-to-new-key code that is not part of a header or a payload of any information blocks that are transmitted between the first and second nodes
1304

FIG. 13

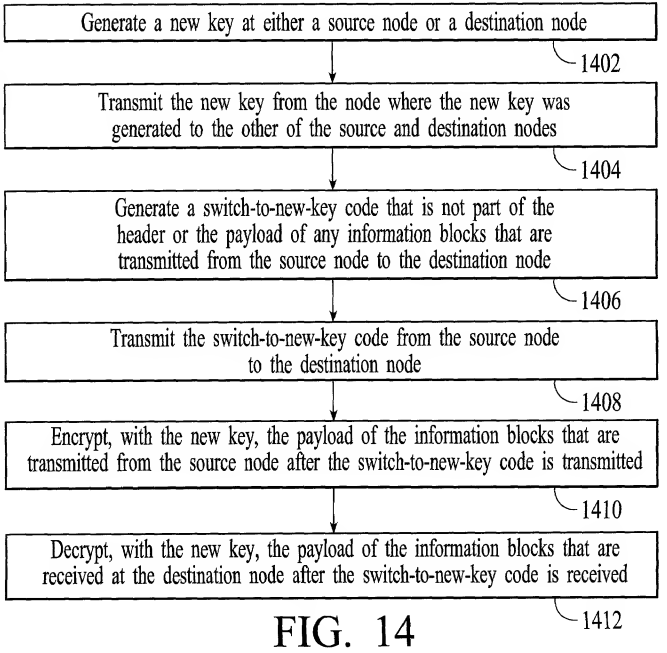
Generate a new key at either a source node or a destination node
1402
Transmit the new key from the node where the new key was generated to the other of the source and destination nodes
1404
Generate a switch-to-new-key code that is not part of the header or the payload of any information blocks that are transmitted from the source node to the destination node
1406
Transmit the switch-to-new-key code from the source node to the destination node
1408
Encrypt, with the new key, the payload of the information blocks that are transmitted from the source node after the switch-to-new-key code is transmitted
1410
Decrypt, with the new key, the payload of the information blocks that are received at the destination node after the switch-to-new-key code is received
1412

FIG. 14